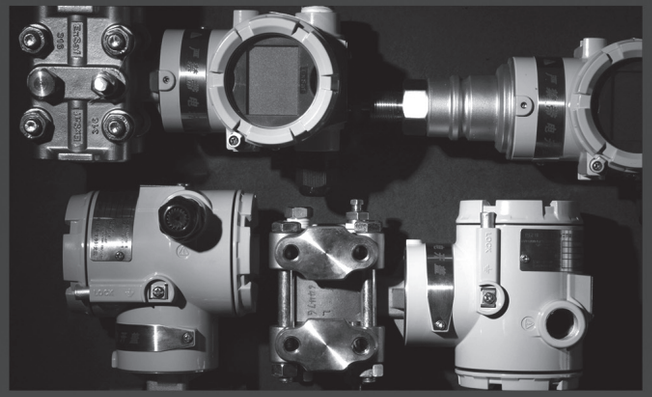

版本号：A2

EXSAF致力于不断优化产品，因此文件中的技术数据会做相应更改。

本资料所介绍的信息是对可选用技术的一般性介绍，并非与所有具体情况完全吻合。
因此，客户要求的技术选项应在合同中予以确定。

www.exsaf.com

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产品说明书
T350T智能压力变送器

中文

English

质量方针

通过我们对工作质量的持续改进来满足顾客的需求并使顾客得到发展及成功!

CE MC 粤制 00000567 号

中文

感谢您选择T350T系列智能压力变送器！

为了确保人身及系统安全，并使产品达到最佳性能，在产品安装、使用或维修前，请完整阅读及理解本手册中的内容，特别是警告和注意的事项。

> ⚠ **警告**
> 重要安全信息，可能导致重大事故、严重财产损失和人身伤亡的危险，必须采取安全防范措施。

> ⚠ **注意**
> 与产品性能有关的重要信息和一般安全信息，如果不避免,可能产生较轻的损害和财产损失。

> ☞ **提示**
> 关于产品操作和性能的一般信息，需要注意。

深圳市特安工业技术有限公司真诚接受任何针对资料内容上的错误或遗漏而提出的批评指正。

目录

中文

1. 概述

1.1 产品特点

T350T系列智能压力变送器（以下简称变送器）采用压阻式传感器和专利技术的高性能电路，适用于石油、化工、燃气、冶金、发电、造纸及食品等工业场合的压力测量。

1.2 测量类型

根据测量类型的不同，变送器可分为以下型号：

型号	含义
T350T-GP	压力变送器
T350T-AP	绝压变送器

2. 安全使用注意事项

⚠ 警告

- 变送器的安装、调校及维护必须由专门的技术人员负责。
- 安装位置的环境极限温度和介质温度均不能超过变送器的工作温度范围。
- 严禁在变送器带压情况下松动过程接头。
- 对于高温、有毒或腐蚀性介质，安装或拆卸变送器时应谨慎操作，以免危险介质泄漏喷出造成伤害。
- 电子线路板的元件易被静电破坏，操作时应采用防静电措施，避免直接接触线路板。
- 应使用满足精度要求的测量设备进行校准，否则影响仪表的正常使用，造成不必要的损失。
- 隔爆型变送器端盖必须按隔爆要求完全啮合，严禁带电开盖，如需打开端盖，必须先断电并确保安全后再打开。
- 对于本安型变送器，须确保回路满足相应的本质安全规程要求。
- 本安型变送器现场安装时，应避免有较高的电压冲击本安电路。
- 经防爆检验合格的产品，不允许随意更换和改动影响防爆性能的元器件和结构。

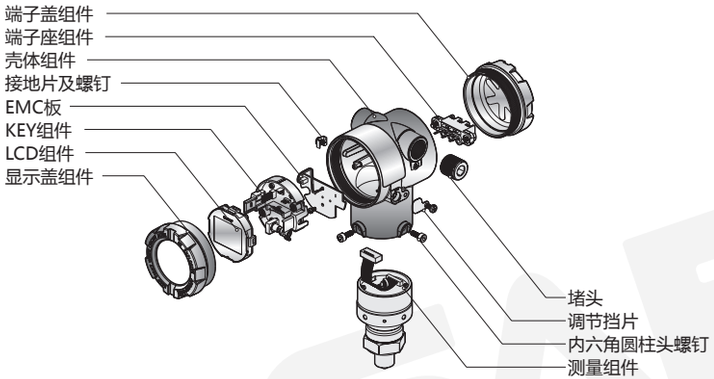
3. 结构特征与工作原理

⚠ 警告

取得防爆合格证的产品，不允许随意更换影响防爆性能的元器件或结构组件。

3.1 总体结构

变送器可分解为压力测量组件、壳体组件、LCD组件、调零旋钮组件及端子座组件等。以下是变送器总体结构图：



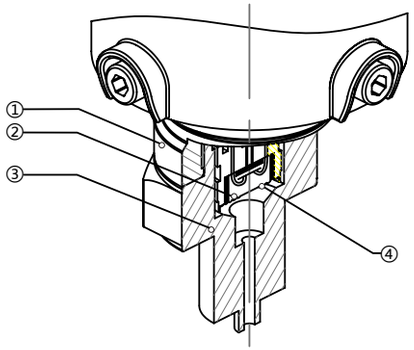
上图仅代表T350T-GP/AP等型号的变送器，其他型号以实际产品为准。

3.2 工作原理

变送器的测量组件主要由压力传感器和测量电路组成。

3.2.1 压力传感器

采用集成电路工艺在晶体硅片上制成压敏电阻，组成惠斯登电桥，作为压力转换的敏感器件。介质压力通过隔离膜片和灌充液传递到敏感器件上，电桥失去平衡，为电桥施加一恒流激励，可将压力信号线性转换成电压信号。以下是压阻式传感器结构示意图：



压阻式传感器剖面图
① 传感器连接座
② 压阻式测量元件
③ 测量元件封装壳体
④ 隔离膜片

3.2.2 测量电路

测量电路对压力传感器信号进行调理和测量，送到数字处理芯片进行运算处理，得出压力值，然后通过显示屏、4-20mA电流和HART通讯等方式输出。此外，测量电路还可以执行工程单位、量程、传递函数和阻尼等功能。

3.3 关键零部件清单

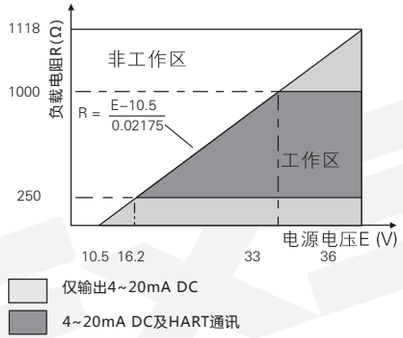
序号	零部件名称	序号	零部件名称
1	压力测量组件	8	EMC板
2	壳体组件	9	端子座组件
3	显示盖组件	10	按键挡板
4	端子盖组件	11	内六角紧定螺钉
5	按键组件	12	堵头
6	LCD组件	13	接地片
7	EMC组件	14	

4. 技术特性

4.1 性能指标

量 程 比：100:1
精度等级：0.075级、0.1级、0.2级
稳 定 性：0.075级：36个月误差为最大量程的±0.15%
0.1级：36个月误差为最大量程的±0.2%
0.2级：36个月误差为最大量程的±0.25%
温度影响：0.075级：零点或量程误差为最大量程的±0.15%/28℃
0.1级：零点或量程误差为最大量程的±0.2%/28℃
0.2级：零点或量程误差为最大量程的±0.25%/28℃
输出信号：二线制，4～20mADC，HART®协议数字信号
超下限电流：3.9mA；超上限电流：20.8mA
故障报警电流：3.75或21.75mA(1)
阻　　尼：0.1～32.0s(2)
电　　源：
隔爆型：10.5~40V DC
本安型：10.5~28V DC

负载电阻：



注：HART通讯要求负载电阻范围是250~1000Ω

防爆认证：隔爆型：Exd IIC T6 Gb
本安型：Exia IIC T6 Ga或Exib IIC T4 Gb
防护等级：IP67
环境温度：选用隔爆型，-30~70℃
选用本安型，-30~60℃

注：输出信号为RS485（ModBus协议）的变送器适用于隔爆环境的场所

中文

执行标准：Q/ES 044—2012《EST&T系列智能压力变送器》
接液温度：-40～104℃
环境湿度：5～95% RH
(1) 故障报警电流出厂默认设置为3.75mA，可通过KEY组件上的跳线设置（详见7.2 故障报警电流设置）。
(2) 阻尼出厂默认设置为1.0s，可通过HART上位机或现场通讯器设置。

4.2 电磁兼容性（EMC）指标

项目名称	试验标准	实验等级	实验条件
静电放电抗扰度	IEC 61000-4-2:2001	3 级	接触：6KV 空气：8KV
射频电磁场辐射抗扰度	IEC 61000-4-3:2002	3 级	频率：80MHz-1000MHz 场强：10V/m
电快速瞬变脉冲群抗扰度	IEC 61000-4-4:2004	3 级	频率：5KHz 电压：2KV
浪涌(冲击)抗扰度	IEC 61000-4-5:2005	3 级	电压：2KV 波形：1.2/50us
射频场感应的传导骚扰抗扰度	IEC 61000-4-6:2006	2 级	频率：150KHz-80MHz 电压：3V（调制）

4.3 本质安全指标及要求

> **提示**
> 以下各符号的具体含义参见GB3836.4-2010和GB3836.15-2000标准。

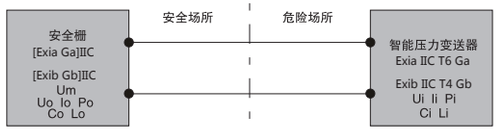
4.3.1 适用环境：
本变送器符合GB3836.1-2010《爆炸性环境 第1部分：设备 通用要求》和GB3836.4-2010《爆炸性环境 第4部分：由本质安全型“i”保护的设备》标准及GB3836.2-2010《爆炸性环境 第2部分：由隔爆外壳“d”保护的设备》标准， 适用于1区、2区，含有 IIA ⅡC类爆炸性气体混合物场所。

4.3.2 本安参数：Ui=28VDC，Ii=93mA，Pi=0.65W，Ci=0μF，Li=0mH。

4.3.3 安装要求：产品安装应按照GB3836.15-2000《爆炸性气体环境用电气设备 第15部分：危险场所电气安装(煤矿除外)》的有关规定进行，并由专业人员安装。

4.3.4 关联设备：本产品须通过安全栅连接，并且安全栅须取得防爆合格证,其安装应按其使用说明书的要求进行。

4.3.5 本安接线示意图：



4.3.6 系统参数匹配原则：
Uo≤Ui ，Io≤Ii ，Po≤Pi ，Cc≤Co-Ci ，Lc≤Lo-Li
Cc 、Lc ：安全栅到本安产品之间连接电缆(或导线)允许的最大分布电容和电感；
Uo：安全栅的最高输出电压；
Io：安全栅的最大输出电流；
Po：安全栅的最大输出功率；
Lo：安全栅允许的最大外部电感；
Co：安全栅允许的最大外部电容；
Ui：本安产品的最高输入电压；
Ii：本安产品的最大输入电流；
Pi：本安产品的最大输入功率；
Li：本安产品的最大内部电感；
Ci：本安产品的最大内部电容。

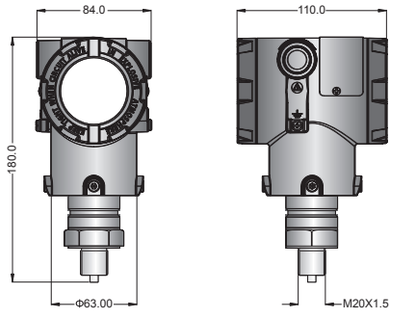
4.4 认证：
计量许可：MC 粤制00000567号
CE 认 证：AE50158221 0001
本安认证：CNEx12.3639X
CNEx12.1233X
隔爆认证：CNEx12.1070
注：输出信号为RS485（ModBus协议）的变送器适用于隔爆环境的场所

中文

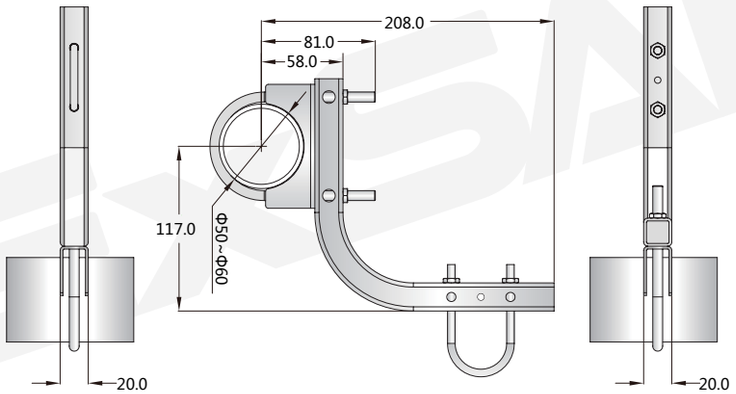
5. 尺寸与重量

> **提示**
> 以下尺寸和重量仅适用于T350T-GP/AP等型号。

5.1 尺寸



变送器尺寸



支架尺寸

单位：mm

5.2 重量

变送器重量：3.5kg

安装支架重量：0.6kg

6. 安装

6.1 型号规格确认

变送器壳体上的铭牌标识了型号和规格，使用前请核对确认。

隔爆型变送器铭牌:

本安型变送器铭牌:

中文

6.2 组态

安装前，应核对变送器的组态信息。

变送器的测量范围、阻尼等组态信息可通过HART上位机或现场通讯器查看和设置。

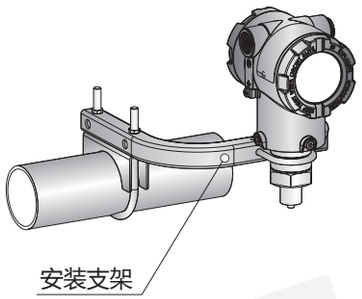
故障报警电流可通过调零旋钮组件上的跳线进行设置

(方法详见“7.2 故障报警电流设置”)。

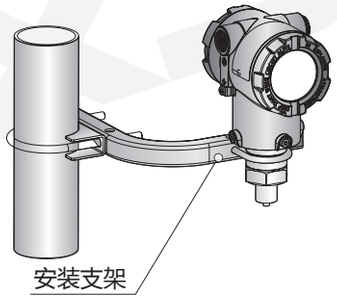
注：输出信号为RS485（ModBus协议）的变送器测量参数组态需由专业技术支持人员完成，RS485通讯参数（波特率，地址，校验）的设置需本公司配备的上位机软件完成。

6.3 安装方式

6.3.1 对于T350T-GP/AP等型号的变送器，可使用我公司提供的安装支架进行安装。安装方式和尺寸如下图所示：



水平管安装方式



立管安装方式

⚠ 注意

- 变送器壳体与压力测量组件的连接部分内有连接线。安装时,壳体最大可顺时针或逆时针旋转180°，切勿过度旋转以造成连接线损坏。
- 安装位置会对变送器的零点产生影响。安装完成后，根据需要对变送器进行零点调整。

☞ 提示

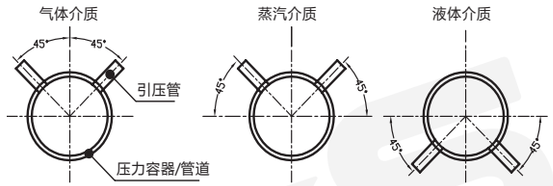
对于带表头的变送器，安装完成后可对LCD显示屏的方向进行调整以方便观察。

6.4 引压管安装

⚠ 注意

- 引压管应尽可能短，并安装在温度波动小、不易形成沉积的位置。
- 为减小摩擦的影响，防止堵塞，应使用足够大的口径的引压管。
- 在高压测量时，引压管要有足够的耐高压强度。
- 引压管应倾斜安装，以便气体从液体介质中排出，或液体从气体介质中排出。

工艺过程中的压力引入角度如下图所示：



压力引入角度

测量气体介质时，引压管应安装在垂直向上及两侧45°范围内，变送器应装在侧面取压口上方，以便液体排入过程管道。

测量蒸汽介质时，引压管应安装在水平方向以上45°范围内，变送器装在侧面取压口下方，以便冷凝液流入引压管。

测量液体介质时，引压管应安装在水平方向以下45°范围内，变送器装在侧面取压口下方，以便气体排入过程管道。

使用侧面有排气/排液阀的变送器，取压口要装到过程管道的侧面。工作介质为液体时，排气/排液阀装在法兰的上部以便排出气体；工作介质为气体时， 排气/排液阀装在法兰的下部以便排出液体。

中文

6.5 接线

⚠ 警告

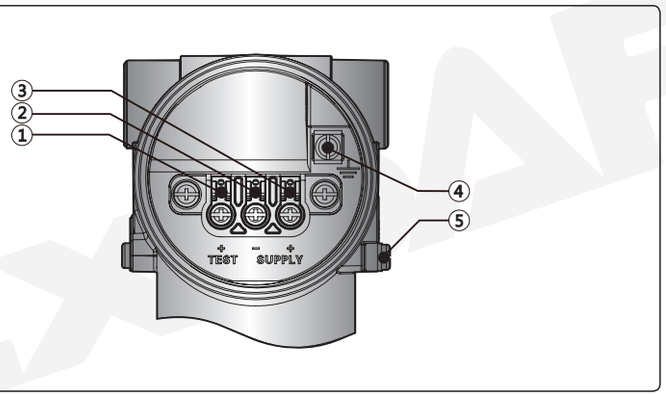
- 在危险场所接线前，必须先确保关闭变送器电源，严禁带电开盖操作。
- 对于隔爆型变送器，电源线必须通过隔爆密封接头引入到壳体内部。隔爆密封接头须满足隔爆型IIC级。如果壳体上另一个接线孔不用，必须用带螺纹的金属堵头塞住。隔爆密封接头和堵头的螺纹最少啮合6扣。
- 对于本安型变送器，须确保回路满足相应的本质安全规程要求

⚠ 注意

- 为避免干扰，变送器的电源线不要与其他设备的电源线置于同一个导线管或线槽内。
- 布线应尽量避开现场存在的强干扰源，如大功率变频器、电机等。
- 在有较强干扰的场所，请使用屏蔽电缆布线，并按将屏蔽层在电源端单点接地。
- 在有雷击可能的场所，应确保变送器外壳良好接地。
- 变送器接线口螺纹处用螺纹密封带(PTFE）或非硬化螺纹密封膏密封以达到防水密封效果。

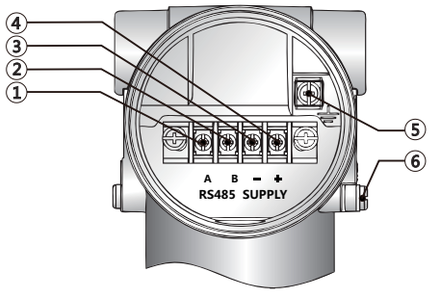
6.5.1 接线端子

6.5.1.1二线制接线端子



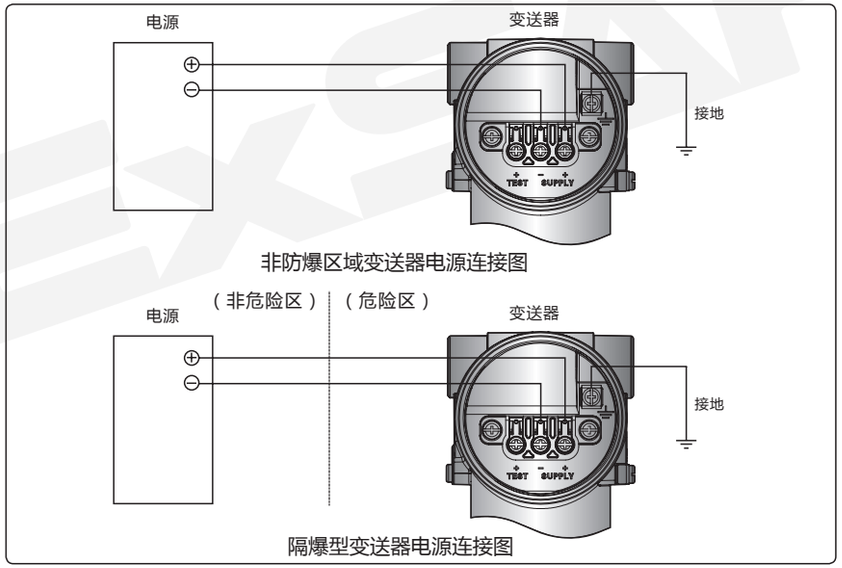
端子(螺钉)编号	功能
①	4~20mA测试端子正
②	变送器电源负（4~20mA测试端子负）
③	变送器电源正
④	内部接地螺钉
⑤	外部接地螺钉

6.5.1.2四线制接线端子（RS485）



端子(螺钉)编号	功能
①	RS485通讯A端口
②	RS485通讯B端口
③	变送器电源负
④	变送器电源正
⑤	内部接地螺钉
⑥	外部接地螺钉

6.5.2 二线制电源线连接



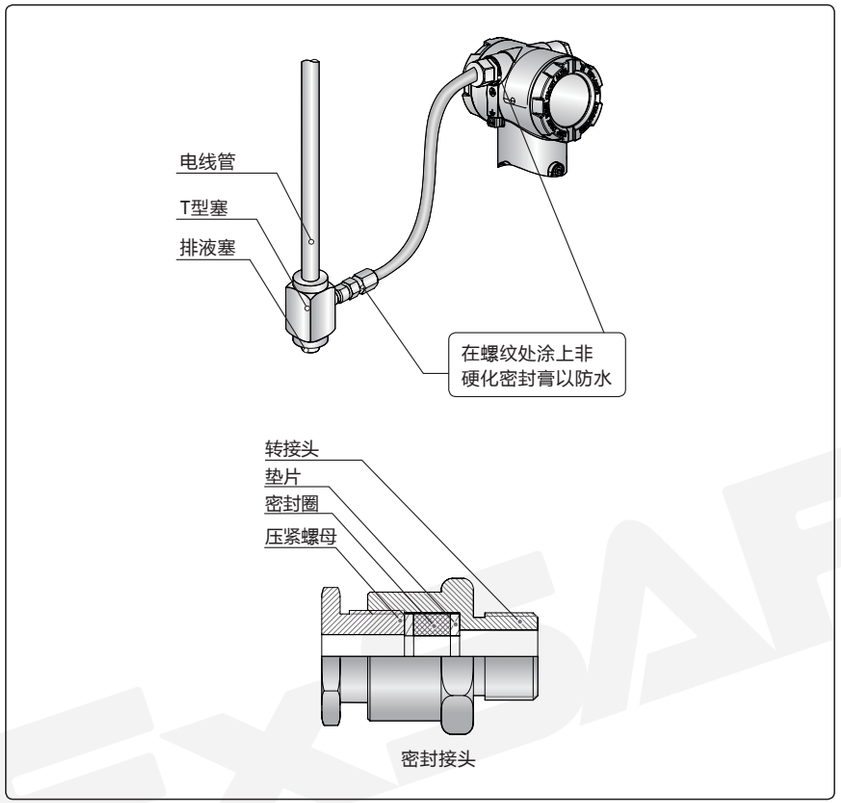
(隔爆型变送器接线时，必须采用满足隔爆型IIC级要求的隔爆密封接头和隔爆金属导线管。)

中文

6.5.3 配线安装

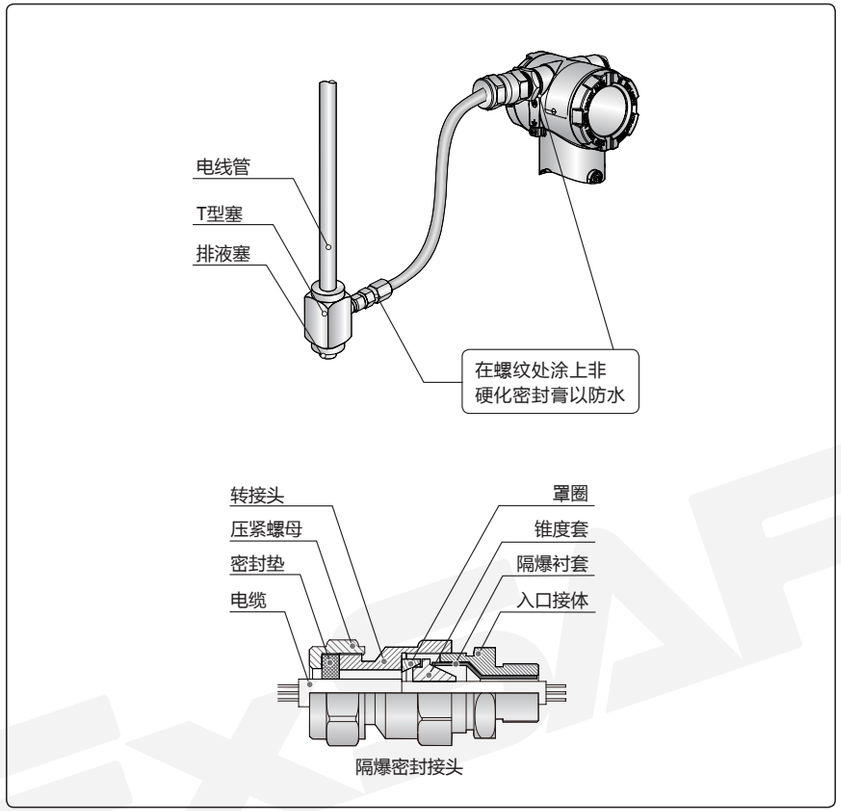
6.5.3.1 本安型密封接头配线

变送器引线口使用密封接头，在螺纹处用螺纹密封带（PTFE）或涂非硬化密封膏以防水。



6.5.3.2 隔爆型密封接头配线

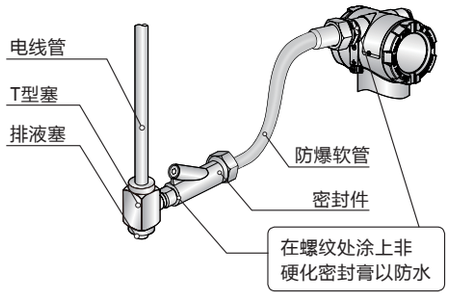
变送器引线口使用隔爆密封接头，在螺纹处用螺纹密封带
（PTFE）或涂非硬化密封膏以防水。

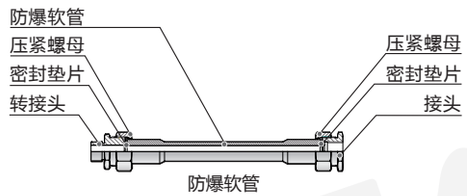


中文

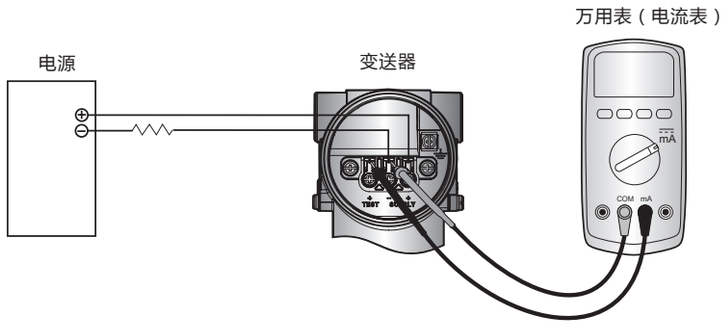
6.5.3.3 隔爆型金属导线管配线

变送器引线口使用隔爆金属导线管，隔爆密封配件穿线后在内部灌冲防爆密封膏密封管道。 在螺纹处用螺纹密封带（PTFE）或涂非硬化密封膏以防水。



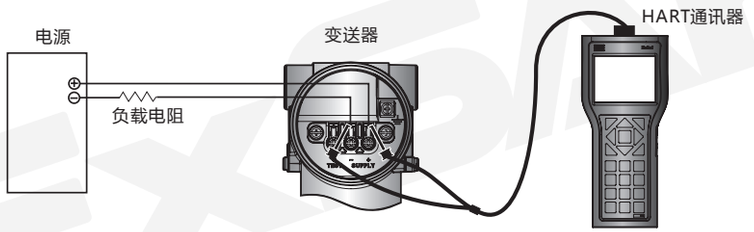


6.5.4 二线制电流检验仪表连接



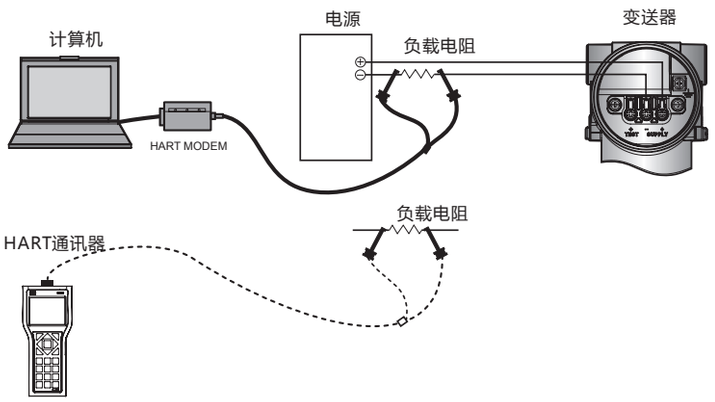
电流检验仪表连接图

6.5.5 二线制HART通讯连接

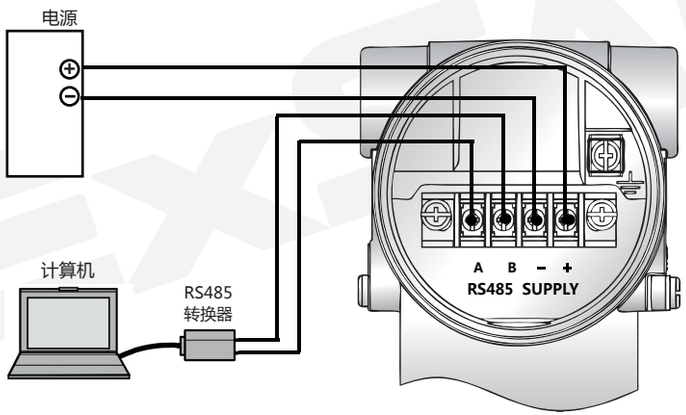


变送器端的HART通讯器连接图

中文



二线制电源端的计算机或HART通讯器连接图

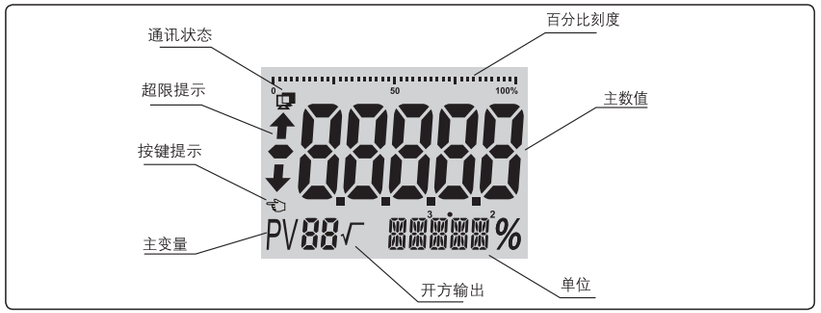


四线制RS485通讯器连接图

7. 使用

7.1 显示表头

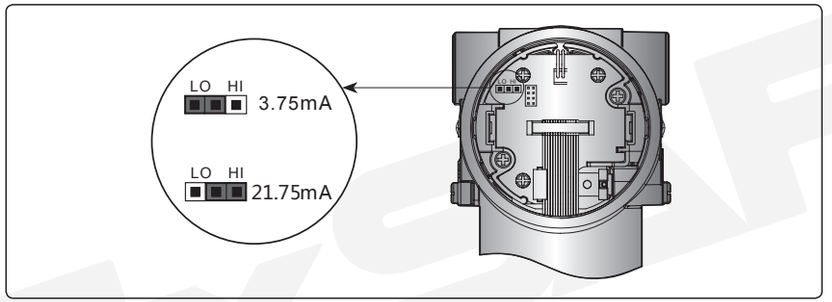
变送器表头采用大尺寸LCD显示屏，可在运行期间实时显示测量数值及系统状态信息，如主变量、百分比、电流值和通讯状态等。



7.2 故障报警电流设置

故障报警电流可通过KEY组件上的跳线进行设置。 如下图所示：

故障报警电流出厂默认设置为3.75mA。



注：输出信号为RS485（ModBus协议）的变送器无故障报警电流输出

7.3 调零

变送器使用中由于安装位置引起的零点变化，可通过调零功能进行校正。变送器支持就地调零和远程调零。

7.3.1 就地调零

1）调零前，保持液位不变；

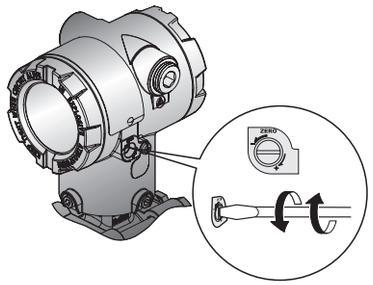
2）用螺丝刀松开变送器外壳的调零挡片固定螺钉，顺时针旋开调零挡片即可看见调零旋钮；

3）用一字螺丝刀旋转调零旋钮，将变送器显示屏的读数或输出电流调整到需要的数值：顺时针旋转时，显示屏左侧显示“🡅”图标，读数和输出电流增加；逆时针旋转时，显示屏左侧显示“🡇”图标，读数和输出电流减小。

调整时，读数和输出电流的变化速度与旋钮的旋转速有关。缓慢旋转时，读数和输出电流的调整步距为变送器量程的0.1%； 快速旋转时，调整步距相应加大。

如果旋转调零旋钮，读数或输出电流却不再变化时，表示当前的调整值过大或过小，此时应停止调整，或反方向旋转调零旋钮。

中文



⚠ 注意

- 就地调零后，不能立即断电。如果调零后30秒内断电，零点将恢复到原值。

7.3.2 远程调零

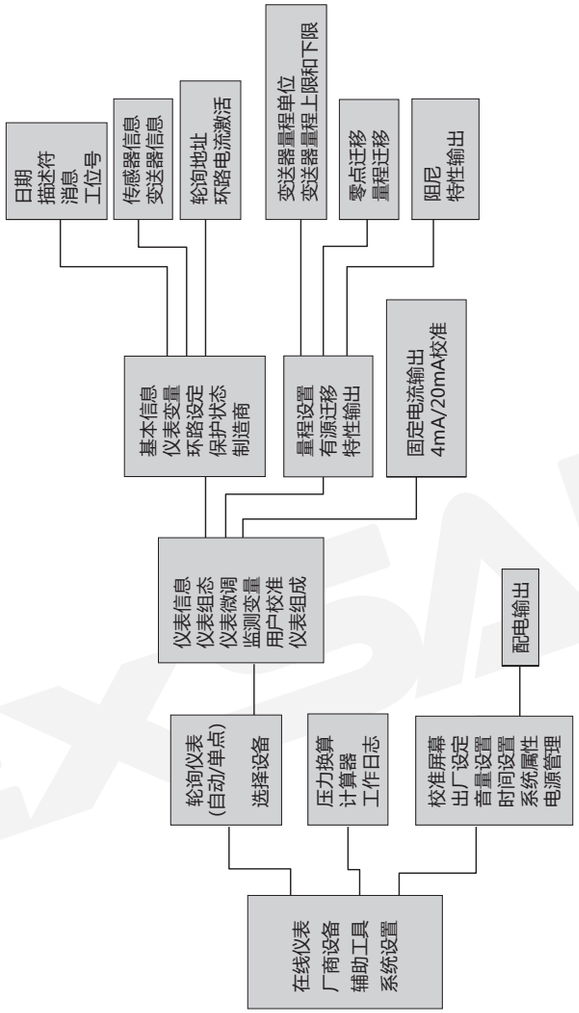
通过HART通讯可实现对变送器进行远程调零，具体的操作方法见组态软件或现场通讯器的使用说明。

7.4 ESH475现场通讯器

变送器具备HART通讯功能，可使用本公司ESH475现场通讯器对变送器进行详细组态和调校。

ESH475现场通讯器的指令树形图如下：

注：输出信号为RS485（ModBus协议）的变送器远程组态需由专业技术支持人员完成



中文

8. 故障现象与排除

变送器出现下表中的故障，按照表中的排除方法仍无法解决时，请联系我公司。

序号	故障现象	故障原因	功能
1	显示屏无显示。	(1) 电源未接或电压过低； (2) LCD组件未插好。	检查电源电压，确保电压满足10.5~36V DC的要求。 (1) 重新拔插LCD组件。
2	表头左下方显示字符"C"，输出电流固定为4mA，且不随压力变化。	(1) HART上位机使变送器进入了"固定电流"模式； (2) HART上位机将变送器的轮询地址设置为非0。	(1) 使用HART上位机退出"固定电流"模式； (2) 使用HART上位机修改变送器的轮询地址为0。
3	显示故障代码"ERR"，输出电流为3.75mA或21.75mA。	变送器故障。	返厂维修。

9. ModBus通讯协议

9.1 通讯参数

通讯模式：MODBUS RTU模式

数据帧组成：1个开始位+8个数据位(+1个奇偶校验位)+1个停止位

可选波特率：1200、2400、4800、9600及14400 (出厂设置为9600)

可选地址：001~255（出厂设置为001 ）

可选校验位：无校验、奇校验及偶校验（出厂设置为无校验 ）

9.2 数据帧格式

本机为从机，且只有读功能，数据帧格式如下：

9.3 主机发送帧：

[设备地址] [命令号03] [起始寄存器地址高8位] [低8位][读取的寄存器数高8位] [低 8位] [CRC校验的低8位] [CRC校验的高8位]

代码	数据含义
[11]	设备地址，本例为11
代码	数据含义
[03]	命令号，读寄存器命令号固定为3
代码	数据含义
[00] [6B]	需读取寄存器的起始地址，本例为107
代码	数据含义
[00] [03]	需读取的寄存器个数，本例为3个寄存器
代码	数据含义
[CRC低] [CRC高]	CRC校验的低8位和高8位

[11] [03] [6B] [00] [CRC低] (选型示例)

9.4从机响应帧：

[设备地址] [命令号03] [返回的字节个数][数据1][数据2]...[数据n] [CRC校验的低8位] [CRC校验的高8位]

注意：在响应帧中，1个寄存器需要返回2个字节的数据。

数据含义如下表：

代码	数据含义
[11]	设备地址，本例为11
代码	数据含义
[03]	命令号，读寄存器命令号固定为3
代码	数据含义
[06]	表示数据的字节个数，即数据1、数据2...数据n中的n值，本例为6个字节
代码	数据含义
[02] [2B]	对应[数据1][数据2] 表示第1个寄存器的高8位和低8位
代码	数据含义
[00] [00]	对应[数据3][数据4] 表示第2个寄存器的高8位和低8位
代码	数据含义
[00] [64]	对应[数据5][数据6] 表示第3个寄存器的高8位和低8位
代码	数据含义
[CRC低] [CRC高]	CRC校验的低8位和高8位

[11] [03] [06] [02] [00] [00] [CRC低] [示例]

9.5寄存器数据列表：

寄存器地址	内容	数据类型
0x00	压强单位	hex
0x01	实时强压	float
0x02		
0x03	电流[mA]	float
0x04		
0x05	百分（%）	float
0x06		
0x07	量程上限	float
0x08		
0x09	量程下限	float
0x0A		
0x0B	阻尼时间	float
0x0C		
0x0D	实时温度	float
0x0E		
0x0F	电压(mV)	float
0x10		

English

Thanks for your selection of T350T family smart pressure transmitter! Read this manual before working with the product. For personal and system safety, and for optimum product performance, make sure you thoroughly understand the contents before installing, using, or maintaining this product. Pay particular attention to Warnings and Cautions.

Warning

For important information that may result in major accident, severe injury or death to personnel, product or property, take safety and preventive measures.

Caution

For major information and general safety information related to product performance, if unavoidable, this could result in minor injury to personnel, or product or property damage.

Note

For general information related to product operation and performance, note.

Shenzhen EXSAF Industrial Technology Co., Ltd. greatly appreciates being informed of any errors or omissions that may be found in the contents of any of our documents.

English

1. Introduction

1.1 Features

T350T family smart pressure transmitter (hereinafter to be referred as transmitter) uses Piezoresistive pressure sensor and high performance circuitry with high stability and accuracy, which is applicable in pressure, liquid level and flow measure in petrol, chemical industry, gas, metallurgy, power plant, paper making and food industries, etc.

1.2 Measure Type

Transmitter is classified into the following models based on measure style:

Model	Description
T350T-GP	Gage pressure transmitter
T350T-AP	Absolute pressure transmitter

2. Safety Messages

⚠ Warning

- When installing, adjusting or maintaining the transmitter, must only be conducted by special technicians.
- Ambient threshold temperature and medium temperature in installation position must not exceed working temperature scope of transmitter.
- Loosening process connector is seriously prohibited when transmitter is in charged.
- For high temperature, toxic or corrosive medium, take care in installing or disassembling transmitter to avoid hazardous medium leaking or spraying to cause injury.
- Component of circuitry board is easily to be damaged by static electricity. Take anti-static precautions in operation to avoid directly touching printed circuit board.
- Use measurement meter meeting accuracy requirement to adjust, otherwise normal application will be affected and unnecessary loss result to it.
- Keep assembly tightly closed during operation according to explosion proof requirement, Access to the interior of transmitter, when carrying out any work, must only be conducted after disconnecting the equipment from the supply circuit.
- For intrinsically safe transmitter, ensure loop meeting relative requirements of intrinsically safe.
- For intrinsically safe transmitter, ensure loop meeting relative requirements of intrinsically safe.
- For site installation of intrinsic safety transmitter, avoid high voltage impacting intrinsic safety circuit.

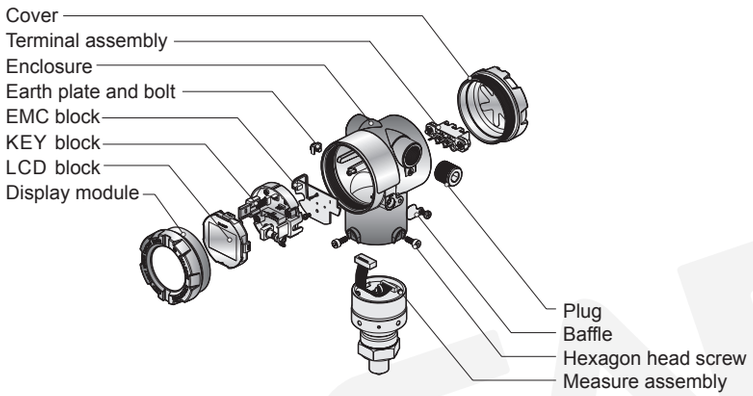
English

3. Structure and Working Principle

> **Warning**
> For products with explosion-proof certificate, randomly replacing components is prohibited.

3.1 Structure

Transmitter is disassembled into pressure measure module, enclosure, LCD module, zeroing knob and terminal assembly, etc. The following is transmitter structure graph:



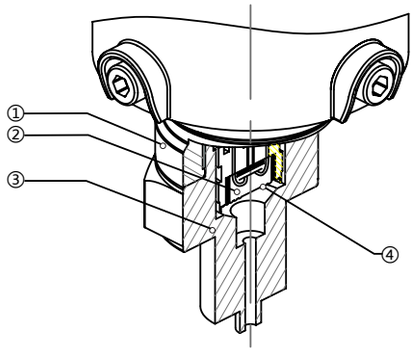
Above graph is only for T350T-GP/AP transmitters, for other models, refer to actual product.

3.2Working Principle

Measure unit of transmitter is composed mainly with pressure sensor and measure circuitry.

3.2.1 Pressure Sensor

Crystal silicon wafer using integrated circuit technology in the varistor made on the form of the Wheatstone bridge, as a pressure sensitive device to convert. Medium pressure through the diaphragm and fill fluid passed to the sensitive device, the bridge out of balance, for the bridge to exert a constant current excitation, the pressure signal line can be converted into voltage signal.The following is silicon piezoresistive sensors sectioned view.



Piezoresistive pressure sensor profile
① sensor connecting base
② piezoresistive measurement component
③ package housing of measurement component
④ isolation diaphragm

3.2.2 Measure Circuitry

Measure circuitry adjusts and measures pressure sensor signal, sends it to processor to calculate and process to acquire pressure value, then output through display screen, 4-20mA current and HART, etc. In addition to it, measure circuitry can execute functions including engineering unit, range, transfer function and damping, etc.

3.3 Main components

Serial NO.	Parts NO.	Serial NO.	Parts NO.
1	Pressure measurement assembly	8	Terminal block
2	Enclosure module	9	Baffle
3	Display cover module	10	Hex head screw
4	Terminal cover module	11	Plug
5	KEY block	12	Earth plate
6	LCD block	13	Earthing
7	EMC block	14	

English

4.Technical Features

4.1 Performance Specifications

Range ability: 100:1

Accuracy: 0.075%, 0.1 %, 0.2 %

Stability: 0.075: ±0.15% of URL per 36 months
0.1: ±0.2% of URL per 36 months
0.2: ±0.25% of URL per 36 months.

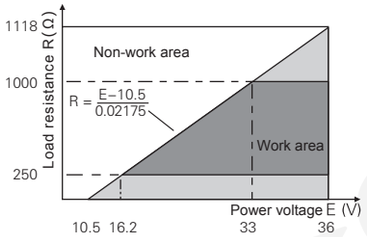
Temperature:0.075: ±0.15% of URL per 28℃
0.1 : ±0.2% of URL per 28℃
0.2: ±0.25% of URL per 28℃

Output signal: 2-wire , 4～20Madc, HART® protocol
Low saturation current: 3.9mA
High saturation current: 20.8mA
Failure alarm current: 3.75mA or 21.75mA[1]

Damping: 0.1～32.0s[2]

Power:
Normal or flameproof style: 10.5~40V DC
Intrinsic safe style: 10.5~28V DC

Load resistance



Only output 4~20mA DC
4~20mA DC and HART communication

Note: HART request load resistance
should be within 250~1000Ω

Explosion proof certificate: flameproof enclosure: Exd IIC T6 Gb
Intrinsic safe: Exia IIC T6 Ga
or Exib IIC T4 Gb

Note: output signal RS485 (ModBus protocol) transmitter is fit for flameproof environment

IP rating: IP67

Ambient temperature: Flame proof enclosure: -30℃~70℃
Intrinsic safe: -30℃~60℃

Note: output signal is RS485(ModBus protocol), transmitter is fit for flameproof enclosure environment.

Performance standard: Q/ES 044— 2012 EST&T series smart pressure transmitter

Process Temperature：-40～104℃

Ambient humidity: 5-95%RH

(1) Failure alarm current factory default setting is 3.75mA, which can be set via jumper on KEY module. (See 7.2 fault alarm current setting in 7.2).

(2) Default damping 1.0s can be set via HART master or field communicator.

4.2 EMC specifications

Item	Standard	Test Grade	Test Condition
Electrostatic discharge immunity test	IEC 61000-4-2:2001	Grade Ⅲ	Contact：6KV Air：8KV
Radiated, radio-frequency, electromagnetic field immunity test	IEC 61000-4-3:2002	Grade Ⅲ	Freq：80MHz-1000MHz Field strength：10V/m
Electrical fast transient, burst immunity test	IEC 61000-4-4:2004	Grade Ⅲ	Freq：5KV Volt:：2KV
Surge immunity test	IEC 61000-4-5:2005	Grade Ⅲ	Volt：2KV Waveform：1.2/50us
Immunity to conducted disturbances, induced by radio-frequency fields	IEC 61000-4-6:2006	Grade Ⅱ	Freq：150KHz-80MHz Volt: 3V (modulated)

4.3 Intrinsic Safe Specifications and Requirements

Note
Refer to GB3836.4-2010 and GB3836.15-2000 for the following symbols.

4.3.1 Applicable environment: the transmitter accords to GB3836.1-2010 “Electric Device Application In Explosive Gases Environment- Part I General Requirements” and GB3836.4-2010 “Explosive atmospheres -Part4: Equipment protection by intrinsic safety"i". It is designed for installation and use in Zone 1 or 2 hazardous areas, including IIAIIC explosive gas mixture site.

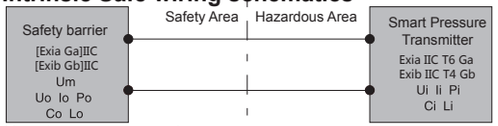
4.3.2 Intrinsic Safe parameters: Ui=28VDC, Ii=93mA, Pi=0.65W, Ci=0μF, Li=0mH.

4.3.3 Installation requirements: accord to related regulations in GB3836/15-2000 Electrical apparatus for explosive gas atmospheres. Part 15: Electrical installation in hazardous areas (other than mines) and installed by professionals.

4.3.4 Related devices: the product must be connected via safety barrier with explosion prevention certificate and its installation must be conducted according to manual.

English

4.3.5 Intrinsic Safe wiring schematics



4.3.6 System parameters

Uo≤Ui, Io≤Ii, Po≤Pi Cc≤Co-Ci, Lc≤Lo-Li

Cc,Lc: Maximum permissible capacitance and inductance of cable (or guiding line) between safety barrier and the product;

Uo: Maximum output volt of safety barrier;

Io: Maximum output current of safety barrier;

Po: Maximum output power of safety barrier;

Lo: Maximum external inductance of safety barrier;

Co: Maximum external capacitance of safety barrier;

Ui: Maximum input volt of Intrinsic Safe product;

Ii: Maximum input current of Intrinsic Safe product;

Pi: Maximum input power of Intrinsic Safe product;

Li: Maximum interior inductance of Intrinsic Safe product;

Ci: Maximum interior capacitance of Intrinsic Safe product;

4.4 Certificates:

Measurement Permits Certification: Yuezhi 00000567

CE Certificate: AE50158221 0001 MC

Intrinsic Safety: CNEx12.3639X

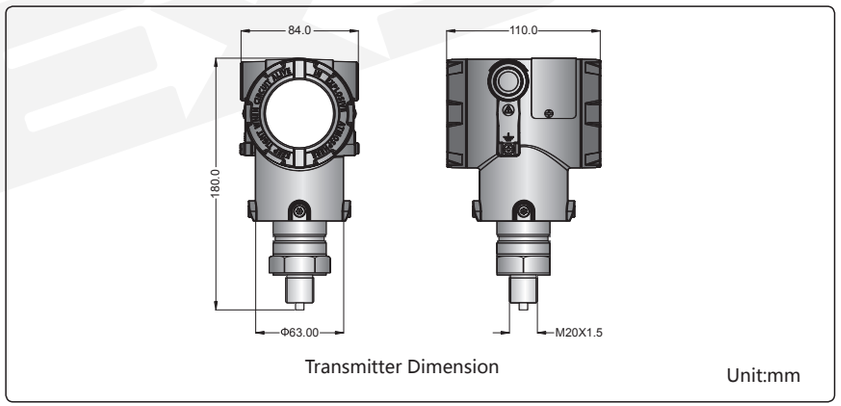
CNEx12.1233X

Flameproof Enclosure: CNEx12.1070

Note: output signal is RS485(ModBus protocol), transmitter is fit for flameproof enclosure environment.

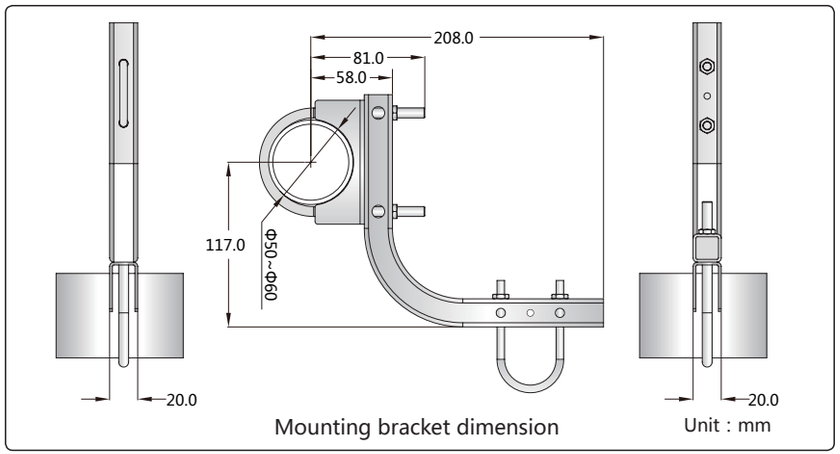
5. Dimension and Weight

5.1 Dimension



Transmitter Dimension

Unit:mm



Mounting bracket dimension

Unit : mm

5.2 Weight

Transmitter weight : 3.5kg

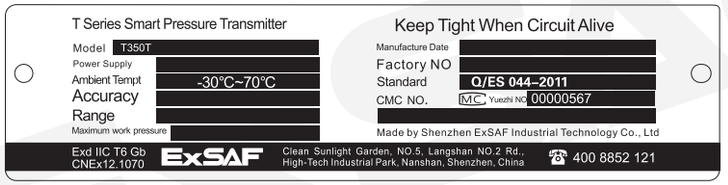
Mounting bracket weight : 0.6kg

6. Installation

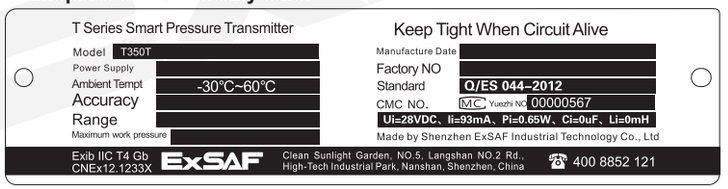
6.1Model Specification Confirmation

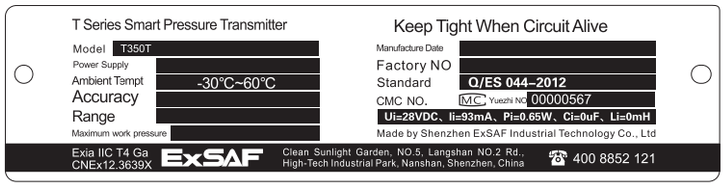
Nameplate of transmitter enclosure marks model and specification, check and confirm before use.

Nameplate of flameproof enclosure:



Nameplate of intrinsically safe:





English

6.2 Configuration

Check configuration info. of transmitter before installation.

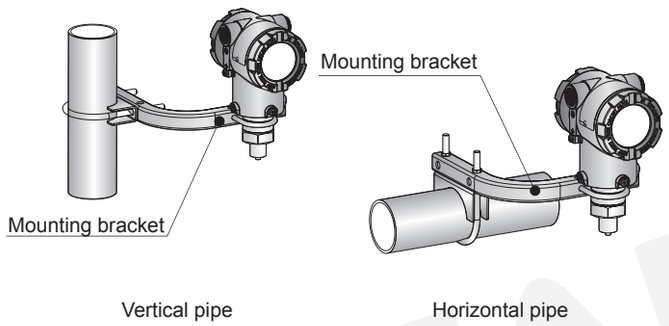
View and set measure scope and configuration of transmitter via HART master or site communication unit.

Set Failure alarm current via jumper on KEY module (see “7.2 failure alarm current setting” in details).

Note: output signal is RS485 (ModBus protocol), technicians complete the configuration of transmitter measurement parameter, the setting of RS485 communication parameter (baud rate, address, verification) shall be completed by Master equipped by ExSaf.

6.3 Mounting

6.3.1 Use mounting bracket from EXSAF to install T350T-GP/AP transmitters. Mounting and dimensions are as follows:



Vertical pipe Horizontal pipe

Note

- There is connection wire between transmitter enclosure and pressure measure module. In installation, enclosure can be rotated 180°at clockwise or counter-clockwise. Do not over tighten to cause the damage of connection line.
- Installation position will cause transmitter zero shift. After installation, zero based on requirements.

Prompt

For transmitter with meter, adjust LCD to facilitate view after completing installation.

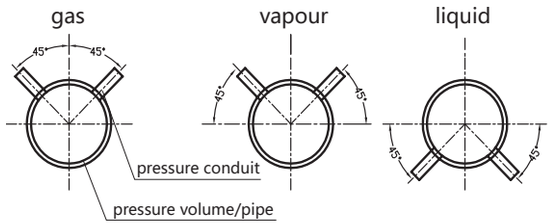
6.4 Impulse Piping

Caution

- Keep piping as short as possible, and install in the position with small temperature fluctuation and not easy to deposit.
- To decrease friction effects and avoid jam, try to use piping with diameter big enough.
- Under high pressure, piping shall have enough pressure resistance.
- Pressure conduit setting shall be installed aslant to facilitate gas eduction from liquid medium or drain from gas medium.

English

Pressure intaking angle during process is as follows:



Pressure intaking angle

Measure gas medium, pressure conduit shall be installed vertically upward or within 45°on both sides, transmitter shall be installed above pressure-relief port to facilitate liquid discharging into process pipe.
Measure vapour medium, pressure conduit shall be installed within 45°on both sides above horizontal, transmitter shall be installed downwards pressure-relief to facilitate condensing liquid discharging into pressure conduit.
Measure liquid medium, pressure conduit shall be installed within 45°on both sides below horizontal, transmitter shall be installed downwards pressure-relief to facilitate gas discharging into process pipe.
Use transmitter with drain/vent valve, pressure-relief shall be set on side of process pipe. Work medium is liquid, drain/vent shall be installed upwards on flange to facilitate gas eduction; Work medium is gas, drain/vent shall be installed downwards on flange to facilitate liquid discharge.

6.5 Wiring

Warning

- Before wiring in hazardous area, ensure transmitter power supply is shut, access to the interior of transmitter must only be conducted with power off.
- For explosion proof transmitter, power cable must be induced into the interior of enclosure via flameproof enclosure seal adapter. Seal adapter must be flameproof enclosure ⅡC grade. If another connection hole on enclosure is idle, use metal plug with screw thread to plug. Flameproof enclosure seal adapter must be engaged with plug with 6 threads at least.
- When used in hazardous area, electricical installation should adhere to GB3836.15-2000 Electrical apparatus for explosive gas atmospheres--Part 15: Electrical installation in hazardous areas (other than mines) and install by professionals.

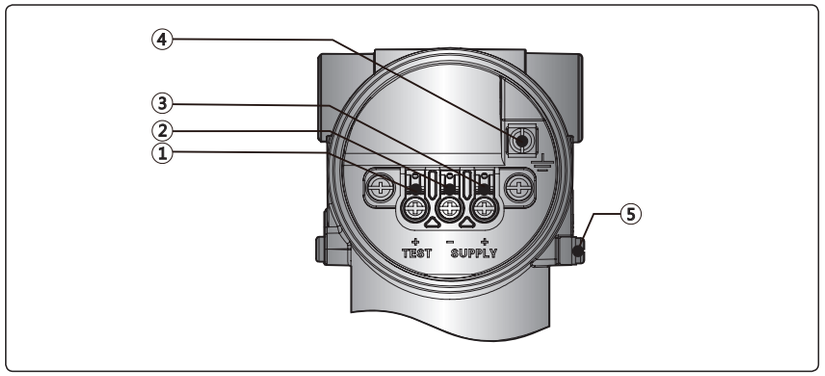
Warning

- To avoid disturbance, transmitter power supply shall not share same impulse pipe or pipe fittings of other equipments.
- Wiring should avoid existing powerful disturbance resource, e.g. large power frequency inverter, machine, etc.
- In the place with strong disturbance, use shielded wire and grounding power terminal on the single point.
- In area with possible lightning strike, ensure transmitter enclosure is earthing well.
- After wiring, check electric interface and ensure fine tightness.

English

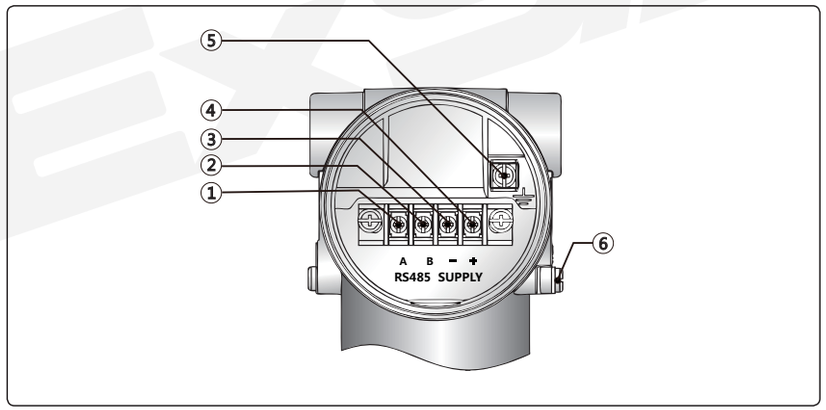
6.5.1 Wiring terminal

6.5.1.1 2-Wire terminal



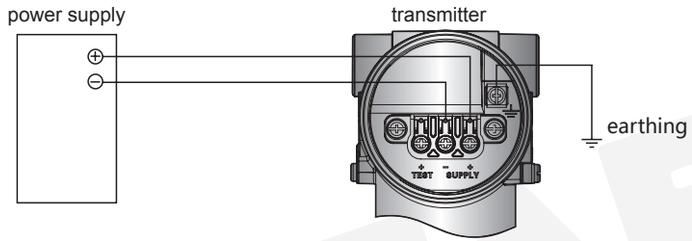
Terminal (bolt) NO.	Function
①	4～20mA test terminal+
②	Transmitter -ve (4～20mA test terminal -)
③	Transmitter +ve
④	Internal ground terminal
⑤	External ground terminal

6.5.1.2 4-Wire terminal

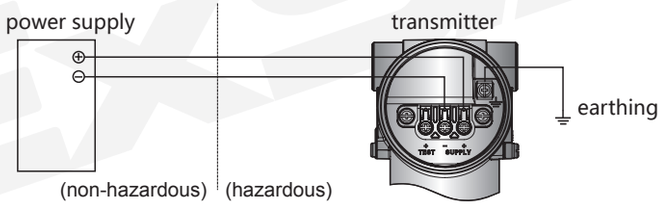


端子(螺钉)编号	功能
①	RS485 communication port A
②	RS485 communication port B
③	Transmitter -ve
④	Transmitter +ve
⑤	Internal earthing bolt
⑥	External earthing bolt

6.5.2 2-Wire Wiring



Transmitter wiring diagram in non-explosive area



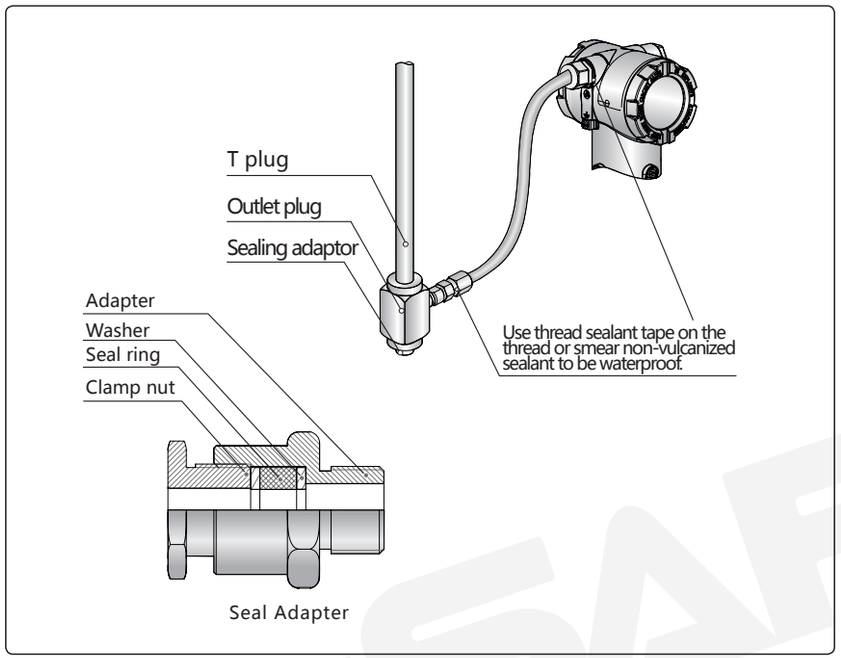
Electrical connection diagram of flameproof enclosure transmitter

(In wiring, flameproof enclosure seal adapter and flameproof enclosure metal conduit meeting IIC explosion prevention grade must be applied.)

6.5.3 Cabling

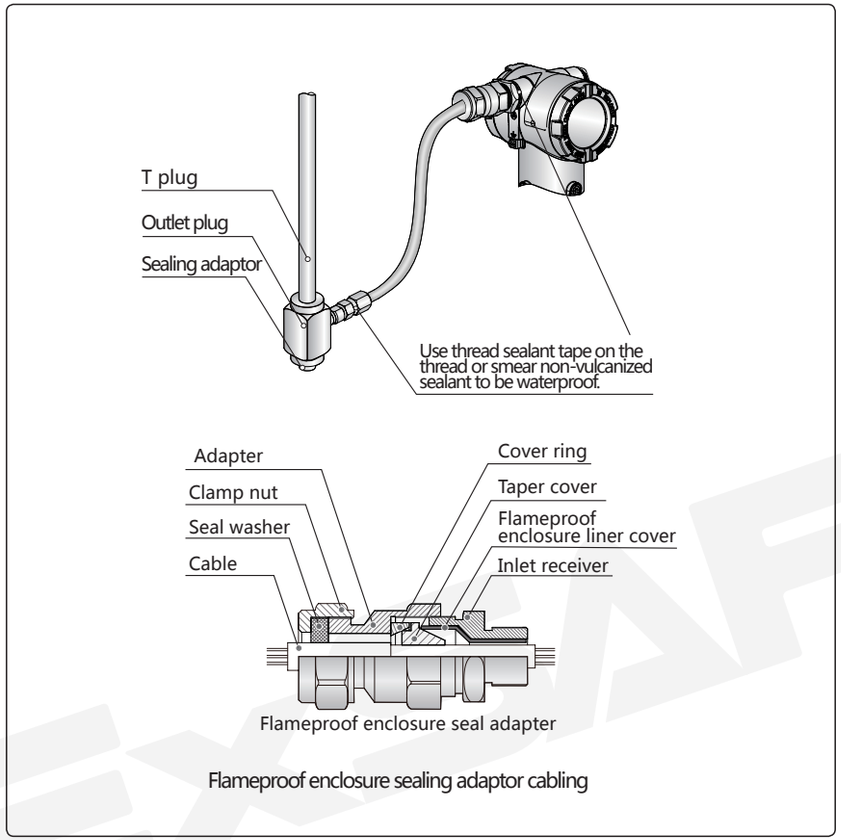
6.5.3.1 Intrinsic safety type

Transmitter entry use sealing adapter, use thread sealant tape (PTFE) at the thread or smear non-vulcanized sealant to be waterproof.



6.5.3.2 Cabling of flameproof enclosure sealing adapter

Transmitter entry use flameproof enclosure sealing adapter, use thread sealant tape (PTFE) at the thread smear non-vulcanized sealant to be waterproof.

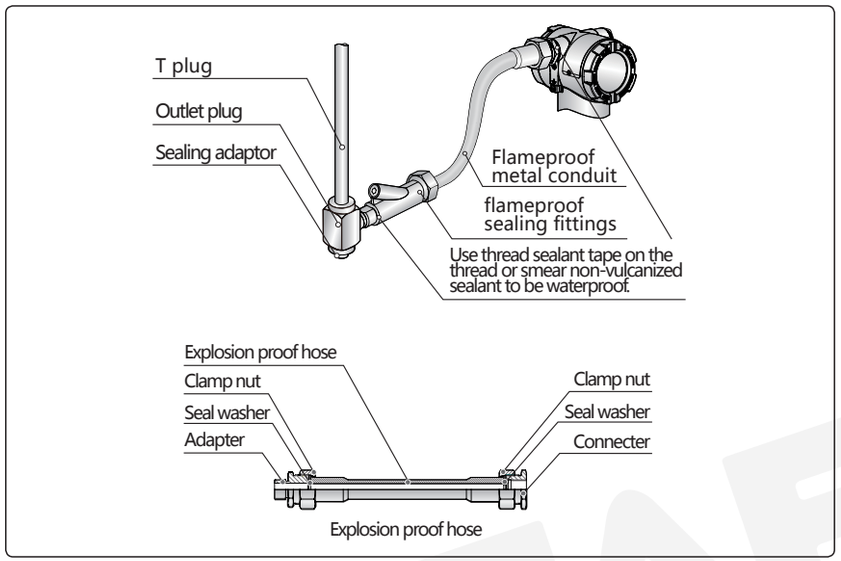


Flameproof enclosure sealing adaptor cabling

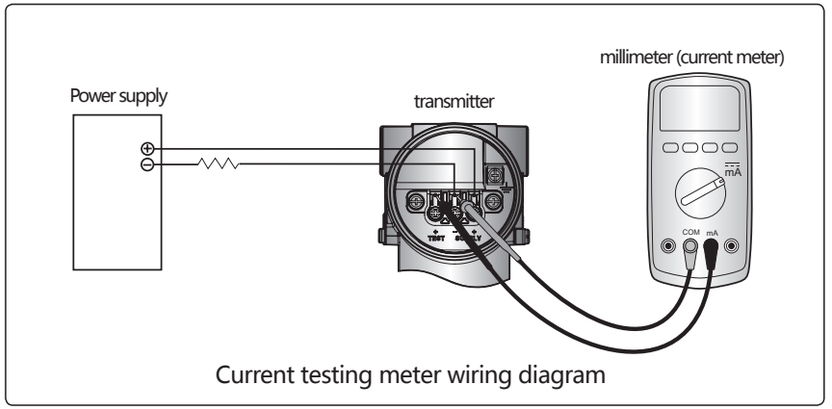
English

6.5.3.3 Flameproof enclosure metal conduit cabling

Transmitter entry use flameproof enclosure metal conduit, flameproof sealing fittings go through conduit and use inside filled flameproof sealant to seal the tube. Use thread sealant tape (PTFE) at the thread or smear non-vulcanized sealant to be waterproof.

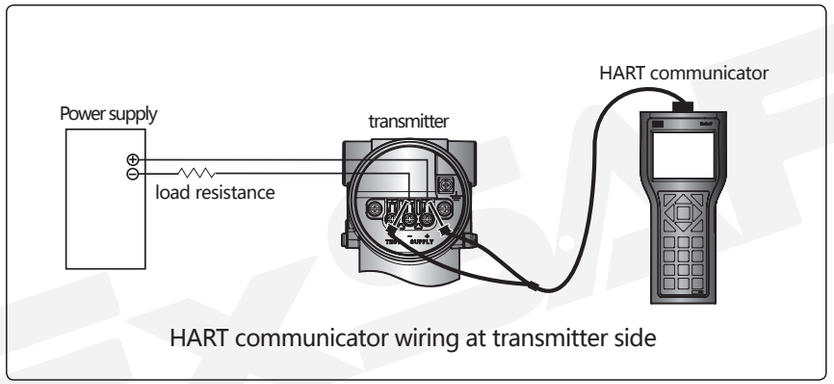


6.5.4 Current testing meter connection



Current testing meter wiring diagram

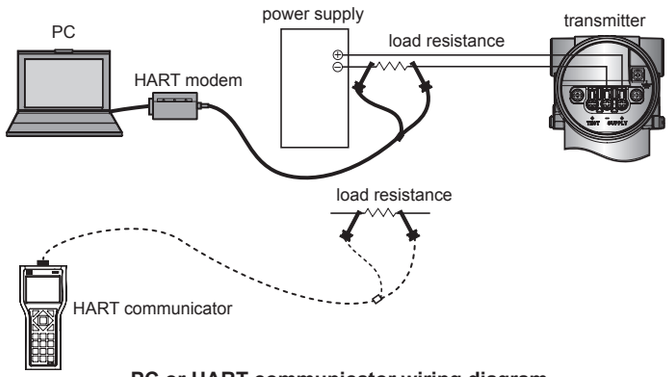
6.5.5 2-Wire HART communication connection



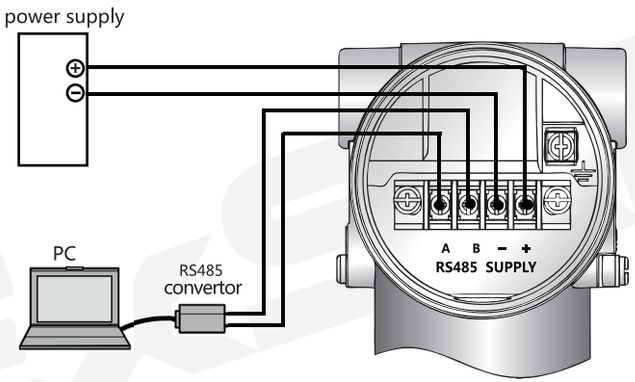
HART communicator wiring at transmitter side

English

6.5.6 communication connection of PC



PC or HART communicator wiring diagram

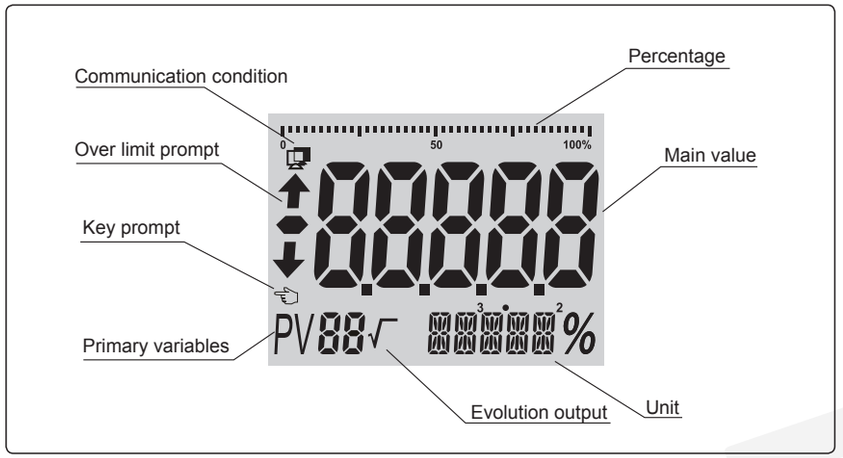


4-Wire RS485 communication connection

7. Application

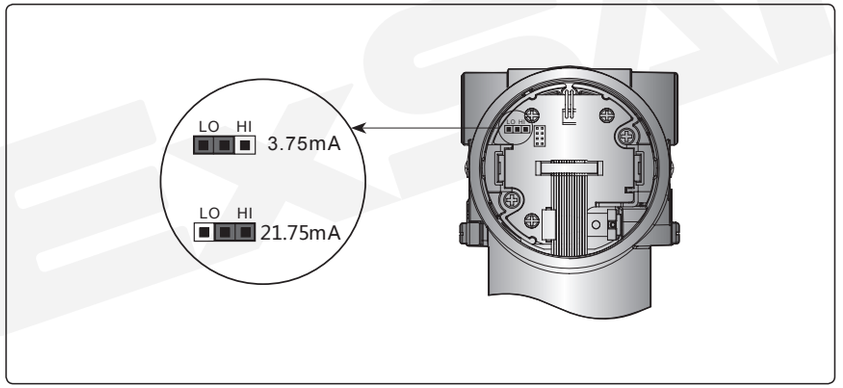
7.1 Meter

Display screen is big size LCD screen; it displays measure value and system status information in running, e.g. primary variables, percentage, current value and communication conditions, etc.



7.2 Failure Alarm Current Setting

Failure alarm current can be set via jumper on KEY module. See following diagram:
Failure alarm current factory default is 3.75mA.



Note :
The transmitter with output signal RS485(ModBus protocol) has no fault alarm current output.

English

7.3 Zeroing

For zero shift caused by installation position in the application of transmitter, adjust via zeroing. Transmitter accepts field zeroing and remote zeroing.

7.3.1 Field zeroing

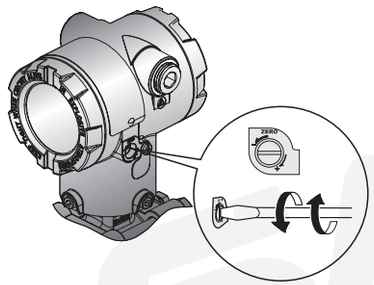
1) keep pressure unchanged before zeroing;

2) use screwdriver to loosen fixing bolt of baffle of transmitter enclosure, rotate zeroing baffle to see zeroing knob.

3) use slotted screwdriver to rotate zeroing knob, adjust readings on screen or output current to be requested values: when rotate at clockwise, screen display icon "↑" at left side, reading and output current increased; when rotate at counter-clockwise, screen display icon "↓" at left side, reading and output current decreased.

When adjust, changing speed of reading and output current is related to rotating speed of knob. When rotate slowly, step distance of reading and output current is 0.1% of transmitter range; when rotate quickly, step distance will be increased correspondingly.

If rotate zeroing knob, reading or output current will not change, representing adjusting value is too big or too small, stop adjusting, or rotate zeroing knob at counter-direction.



Note

Do not power off promptly after zeroing at site. If power off within 30s after zeroing, zero will resume the original value.

Note: the remote configuration of transmitter with output signal RS485 (ModBus protocol) is completed professional technicians.

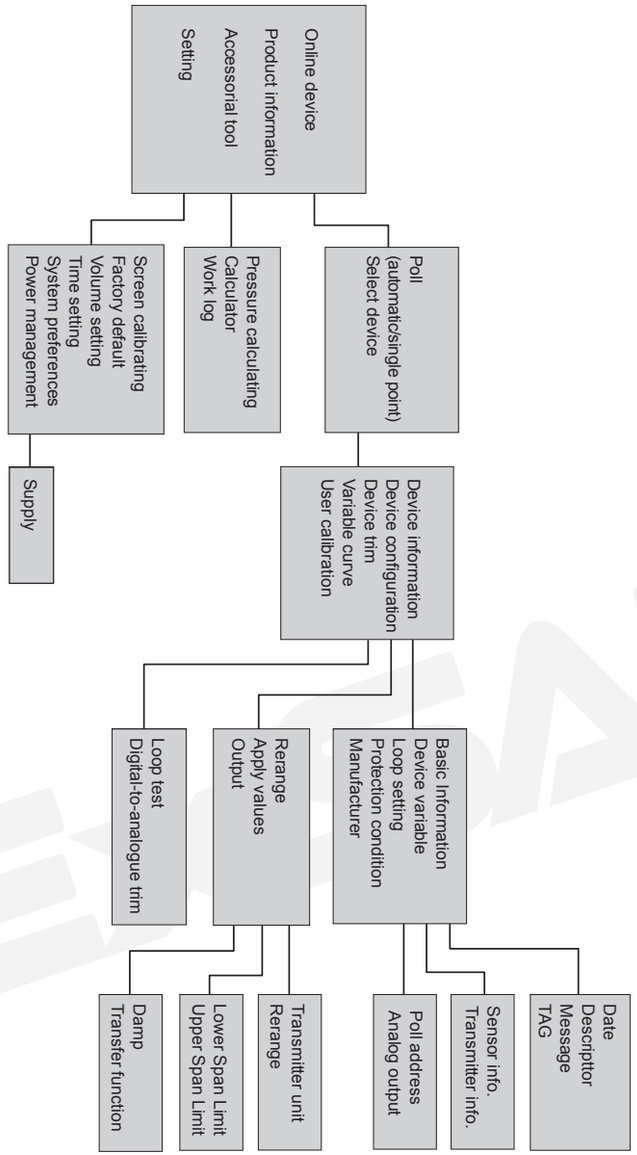
7.3.2 Remote zeroing

Conduct remote zeroing on transmitter via HART communication, the specific operation method refers to configuration software or manuals of field communicator.

7.4 ESH475 field Communicator

Transmitter has function of HART communication, using ESH475 site communicator to configure and adjust in details on transmitter.

Tree-like format order of ESH475 site communicator is as follows.



English

8. Troubleshooting

For the following failures within the table, resolve according to measures within the table. If fails, contact EXSAF.

Serial NO.	Description	Reason	Function
1	Screen no display	(1) Power disconnected or voltage is over low; (2) LCD module is not engaged well.	Check power voltage; ensure voltage meeting requirements of 10.5-36V DC. (1)Re-plug LCD module.
2	Lower left side of meter display"C", output current is fixed to be 4mA, will not alter according to pressure variation.	(1) HART master cause transmitter entering "loop test" mode; (2) HART master set loop address to be 0.	(1)Exit from "loop test" mode via HART master; (2)Modify loop address of transmitter to be 0 via HART master
3	Display fault code is "ERR"; output current is 3.75mA or 21.75mA.	Transmitter fault	Return to factory service

9. ModBus Communication Protocol

9.1 Communication parameters

Communication mode: MODBUS RTU mode
Data frame composition: 1 start bit+ 8 digit bit (+1 parity check bit)+1 stop bit
Optional baud rate: 1200,2400,4800,9600 and 14400 (factory setting:9600)
Optional address: 001-255 (factory setting:001)
Optional check bit: no parity, odd parity and even parity (factory setting is no parity)

9.2 Data frame format

The machine is client, only readable; data frame format is as follows:

9.3 Master transmit frame:

{device address} {order NO.03} {origin register address high 8-bit}
{Low 8-bit} {readable register number high 8-bit} {low 8-bit}
{CRC check low 8-bit} {CRC check high 9-bit}

DATA meaning is as following table:

Code	data meaning
[11]	device address,take 11 for instance
Code	data meaning
[03]	Command,read register order NO is fixed to be 3
Code	data meaning
[00]	read origin register address, take 107 for instance
[6B]	
Code	data meaning
[00]	read register numbers, take 3 for instance
[03]	
Code	data meaning
[CRC low]	CRC check low 8-bit and high-8
[CRC hi]	

[11]	[03]	[6B]	[00]	[CRC low]	[example]

9.4 Client Response Frame :

[Device address] [order NO. 03] [returned bit quantity] [data 1] [data2].....[data n]
[CRC check low 8-bit] [CRC check high 8-bit]

Note: in response frame, 1 register requires returned 2-bit data.

English

Data meaning is as following table:

Code	data meaning
[11]	device address,take 11 for instance
Code	data meaning
[03]	Command,read register order NO is fixed to be 3
Code	data meaning
[06]	Number Bytes of data,such as data 1,data2,...n of data. Take 6 bits for instance
Code	data meaning
[02]	responding [data1] [data 2].
[2B]	express high 8-bit and low 8-bit of the first register
Code	data meaning
[00]	respond [data 3] [data 4]
[00]	express high 8-bit and low 8-bit of the second register
Code	data meaning
[00]	respond [data 5] [data 6]
[64]	express high 8-bit and low 8-bit of the third register
Code	data meaning
[CRC low]	CRC check low 8-bit and high-8
[CRC hi]	

[11]	[03]	[06]	[02]	[00]	[64]	[CRC low]	[example]

9.5 Register data table:

Register Address	Item	Data type
0x00	Bar unit	Hex
0x01	Actual bar	Float
0x02		
0x03	Current(mA)	Float
0x04		
0x05	Percentage (%)	Float
0x06		
0x07	URL	Float
0x08		
0x09	LEL	Float
0x0A		
0x0B	Damp time	Float
0x0C		
0x0D	Actual temperature	Float
0x0E		
0x0F	Voltage (mV)	Float
0x10		